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DETERMINANTS OF DEMAND AND SUPPLY

FOR HOUSING IN ONTARIO

Econometric Research Branch
Central Statistical Services Division
Ministry of Treasury, Economics
and Intergovernmental Affairs

July, 1975



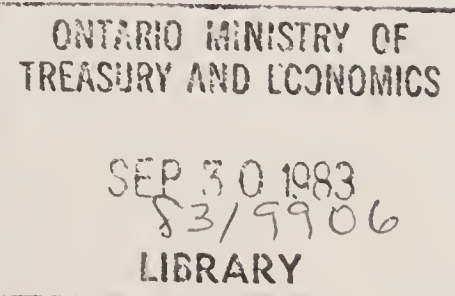
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INTRODUCTION

In recent years housing has become a very important issue in Ontario, as it has in many other Provinces. With constantly rising prices of housing units as a result of the rapidly increasing demand and comparatively slowly increasing supply, it is now more difficult for lower-income families to acquire their own houses without government assistance. The Advisory Task Force on Housing Policy estimated that in Ontario today 300,000 to 400,000 families, or one family out of every six, require some kind of financial assistance for housing.

Generally speaking, the role of government in solving the housing problem is to make sure that enough housing units are available to meet the increasing demand at prices that can be afforded by prospective purchasers. As government policies can affect the housing market by changing the supply-and-demand schedules, the solution to the housing problem obviously requires active public participation in the private sector. Since an understanding of the determinants of housing supply and demand is a prerequisite to evaluating such a housing policy, estimation of housing demand and supply functions must precede evaluation of the economic effects of government policies on housing.

If the report by the Advisory Task Force on Housing Policy is the first major qualitative public examination of Ontario housing, this report is probably the first major quantitative public

examination of the housing sector. However, as available data are limited and because many economic causes and effects are difficult to quantify, this study is more limited in scope than the Housing Report. As more required data become available, the present study can be refined and expanded. At this time, housing for Ontario as a whole is examined. Later on, the coverage could be extended to three major metropolitan areas in Ontario: Toronto, Hamilton and Ottawa.

The present study, carried out by the Econometric Studies Section, attempts to identify the most significant factors determining aggregate supply and demand for housing in Ontario. For those interested in the technical details of the Ontario Housing Model, a comprehensive exposition is available on request. The first Chapter explores the availability and sources of data. Chapter II outlines the assumptions used in arriving at housing supply and demand relationships which are discussed in the third Chapter. The statistical results are presented in Chapter IV, and the last Chapter is devoted to policy applications.

I. AVAILABILITY OF BASIC HOUSING STATISTICS

By basic housing statistics, we refer to housing starts, completions, stocks, etc, which we usually have to explain in a housing study. It is important to make sure that these basic statistics are available before we explain supply and demand forces in the housing market.

Most of the basic housing statistics for Ontario can be obtained from Canadian Housing Statistics published by Central Mortgage and Housing Corporation (CMHC) and New Residential Construction published by Statistics Canada. Data from these two sources are classified almost by the same type of dwelling (hereafter called CMHC Classification). Data on housing stock are available only from the Census. It should be noted that the classification used in the Census to record housing stock (hereafter called Census Classification) is different from the CMHC Classification. The differences and the relationships between the CMHC Classification and the Census Classification are summarized as follows:

CMHC Classification

- (S1) Single-Detached
- (S2) Semi-Detached and Duplex
- (S3) Row
- (S4) Apartment and Other

Census Classification

- (C1) Single-Detached
- (C2) Single-Attached
 - (C2a) Double House
 - (C2b) Other
- (C3) Apartment or Flat
 - (C3a) Duplex
 - (C3b) Other

Relationships between Classifications

$$\begin{aligned}(S1) &= (C1) \\(S2) &= (C2a) + (C3a) \\(S3) &= (C2b) \\(S4) &= (C3b) \\(S2) + (S3) &= (C2) + (C3a) \\(S2 + S3) + (S4) &= (C2) + (C3)\end{aligned}$$

The component (S1) is commonly called "single housing" and the sum of the components (S2), (S3) and (S4) constitutes "multiple housing". Since most of the housing statistics are available in terms of the CMHC Classification, it is necessary for us to use this Classification in our analysis of the housing market as well as in further disaggregation of multiple housing. Although it is not feasible to separate single attached housing from apartment units according to the Census Classification, it is possible to disaggregate multiple housing either into three components: (S2), (S3) and (S4) or two components: (S2 + S3) and (S4) using the CMHC Classification. However, most of the other variables besides housing starts, completions and stocks are usually available only for two types of housing: single and multiple. Therefore, from the point of view of data availability, housing analysis based on the framework of this study can be carried out with a breakdown into single and multiple units. Chart I on the following page illustrates the classifications of housing statistics.

Census Data

In 1971, the ownership ratios, (the proportion of houses owned in relation to total occupied housing units), for (S1), (S2 + S3) and (S4) were 0.881, 0.487 and 0.050 respectively. For the total of S2, S3 and S4 the ownership ratio was 0.223. Obviously, single-detached housing units and apartments are overwhelmingly owner-occupied and tenant-occupied respectively. The case is not so clear-cut in

CLASSIFICATIONS OF HOUSING STATISTICS

CMHC Classification

- (S1) Single-Detached
- (S2) Semi-Detached and Duplex
- (S3) Row
- (S4) Apartment and Other

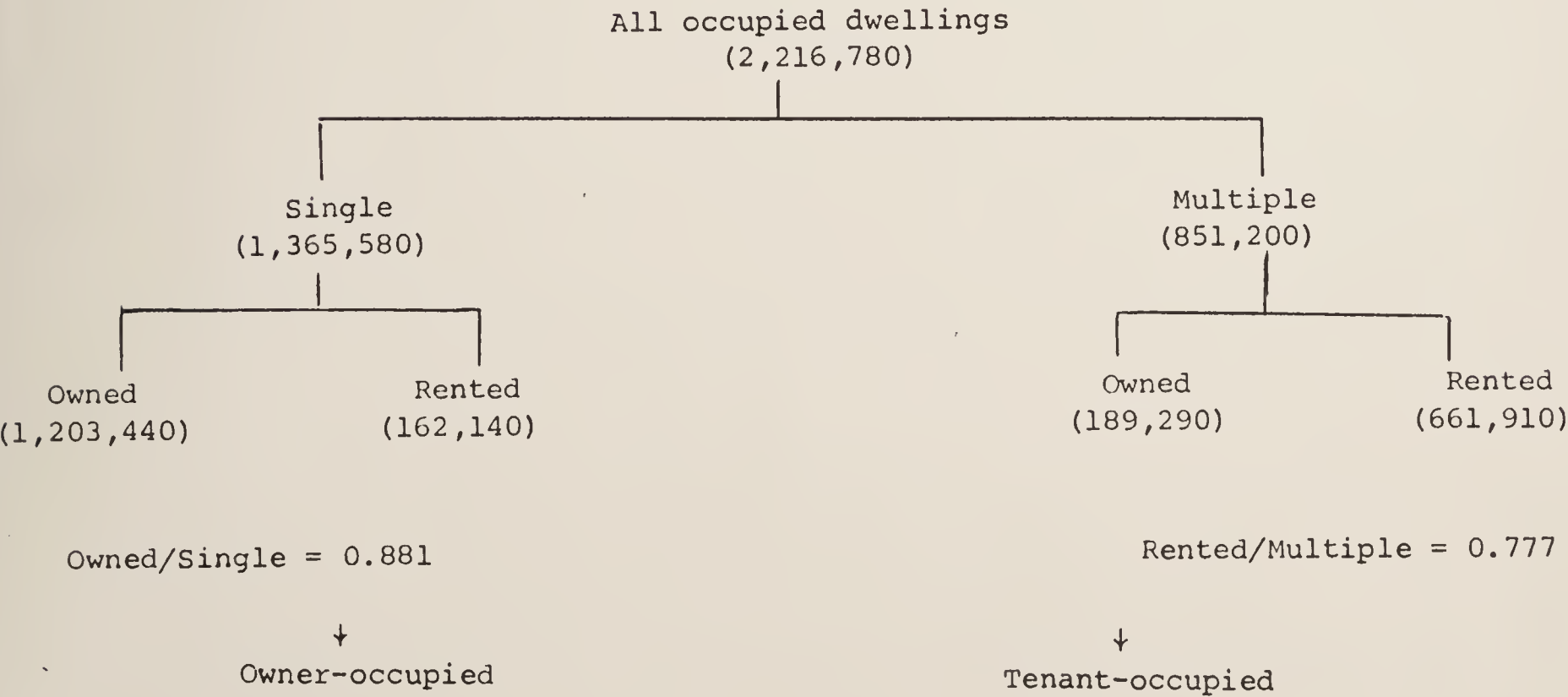
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 - (C2b) Other
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 - (C3a) Duplex
 - (C3b) Other

Relationships between Classifications

$$\begin{aligned}
 (S1) &= (C1) \\
 (S2) &= (C2a) + (C3a) \\
 (S3) &= (C2b) \\
 (S4) &= (C3b) \\
 (S2) + (S3) &= (C2) + (C3a) \\
 (S2) + (S3) + (S4) &= (C2) + (C3)
 \end{aligned}$$

Housing Stock in Ontario
(1971 Census data, dwelling units)



semi-detached, duplex, and row housing even though these are, on average, tenant-occupied. The significant difference between the ownership ratios of (S1), (S2 + S3) and (S4) indicates the desirability of further disaggregating multiple housing.

II. ASSUMPTIONS

A. Basic Elements of the Housing Market

Generally speaking, a housing study should incorporate at least two features:

- a) It should be disaggregated into housing markets by region and type of housing.
- b) It should incorporate the influences of demand and supply.

The separation of housing markets by region is desirable because there is no transferability of the services of housing units from one location to another. Aggregate analysis, therefore, may sometimes conceal a serious imbalance in the form of excess supply of units in some regions and excess demand in others. Analysis of housing markets by type of housing is also recommended because the behaviour of each type of housing market is different. Although it would be desirable to disaggregate the housing market as much as possible, the data availability at the present time suggests that analysis could be carried out with a breakdown into single and multiple housing units.

There are certain differences between single and multiple housing units. First, they are usually occupied by different groups of residents: single housing by family and multiple housing by non-family households. Secondly, purchasers of single units are more likely to be owner-occupants while institutional investors purchase multiple units for investment purposes. This has the implication that households demanding single units behave in the same manner as consumers, while the behaviour of institutional investors investing in multiple units resembles that of business firms.

The financial arrangements, tax treatment and sources of financing therefore differ between these two groups. Thirdly, these two types of housing may also generate different expenditure patterns.

To explain clearly the operation of the housing market, the behaviour of the housebuilders (housing supply) and the consumers of housing services (housing demand) must be explicitly considered in a housing study.

Many studies on housing are based on a market clearing assumption (demand for housing is equal to supply) even though they may describe the behaviour of the housing market in different ways. On the other hand, some existing studies analyse housing requirements simply on the basis of demand-related economic variables such as household formation. This treatment fails to take into account important supply factors including the cost of land, labour and materials.

The neglect of supply forces may be justified in the projection of housing requirements in the long-run context because real resources for residential construction in the long run are presumably potentially available, so that the supply of housing will usually meet the effective demand at a certain cost level. However in a study, such as this, of short-run analysis the constraints in supply are the availability of land, building materials, and labour.

A projection of housing demand without taking into consideration the influence of supply is what is called "housing demand at a given cost". As cost factors do not remain fixed over time, the projected housing demand will also change as a result of changes in cost. Housing

requirements are, therefore, never correctly projected without considering the influence of supply. In other words, we believe that real resources for residential construction will not be automatically available to meet effective demand at fixed cost. If more housing units are demanded, and the housing market is allowed to operate on its own force, then the probable outcome would be for the supply to be equated to the increased demand at a higher price. The actual housing requirements or the demand for housing is determined at the level at which the supply of housing equals the demand for housing.

In Ontario, the rising price of housing units in recent years has been the result of a rapidly increasing demand coupled with a comparatively slowly increasing supply owing to constraints in land, materials and labour. It is for this reason that a study of housing in Ontario must be based on a framework which takes into account the interaction of supply and demand rather than on a stock adjustment mechanism in which only the demand aspect is explicitly considered.

B. Basic Assumptions of the Housing Market

In our analysis of housing, four groups of participants and three separate markets may be distinguished. The groups of participants include:

- purchasers of housing stock.
- consumers who demand the housing services.
- developers who build the housing units.
- financial intermediaries who supply the funds to finance the purchase and construction of housing e.g., chartered banks, trust companies, life insurance companies, mortgage loan companies.

Each of these groups may be further divided into two categories with respect to single and multiple housing units.

We may also distinguish between

- the market for housing stock
- the market for housing services, and
- the market for mortgage funds.

While one group of people may participate in more than one market, there are some groups who participate in one market but not in others. For example, Developers and Purchasers usually participate both in the Housing Stock and Mortgage Markets because the people who buy and build houses also demand mortgage funds. However, those who demand housing services do not normally participate in the mortgage market, unless they are purchasers of housing stock.

Judging from the relationships among four groups of people in three markets, we can see how complicated a housing model can be if all the interactions are taken into account. Therefore, some assumptions are made in order to simplify our analysis.

(A1) Integration of two housing markets --

There are clearly two housing markets to be considered: the market for housing stock (investment good) and the market for housing services (consumer good). Since the demand for housing stock is just the derived demand for housing services, the demand for housing in this study, unless specified otherwise, is interpreted as the demand for housing services. The flow of housing services, however, is not an observed magnitude.

The usual assumption in many studies on housing is that housing services are taken to be proportional to the real value of housing stock (i.e., the utilization rate of housing stock is constant) so that the unobservable service flow demand is represented by an observable stock demand. With this assumption, the housing stock is the only input in the production of housing services and the markets for housing services and stock are integrally related. The utilization rate of the housing stock in this study is assumed to be unity as in most of the studies on housing, so that the housing services are identical to housing stock in magnitude.

(A2) The mortgage rate is exogenously determined --

In view of the purpose of this study, special attention is given to the housing market rather than to the mortgage market. Therefore, the mortgage rate which is supposed to be determined in the mortgage market by equating the supply of and demand for mortgage funds is taken as exogenous in the market for housing services. Under this assumption, the determination of the demand for and supply of mortgage funds is avoided in the present study.

(A3) Use of single and multiple housing units as proxies for owner-occupied and rental housing units --

The logic for this assumption is self-explanatory because single units are primarily owner-occupied and multiple units are primarily tenant-occupied.

With assumptions (A1) - (A3), the housing model is greatly simplified by considering explicitly only two groups of people: consumers of housing services and builders, and only one market: the market for housing services. The following Chart illustrates the basic characteristics of the housing market and the assumptions discussed earlier.

CHART II

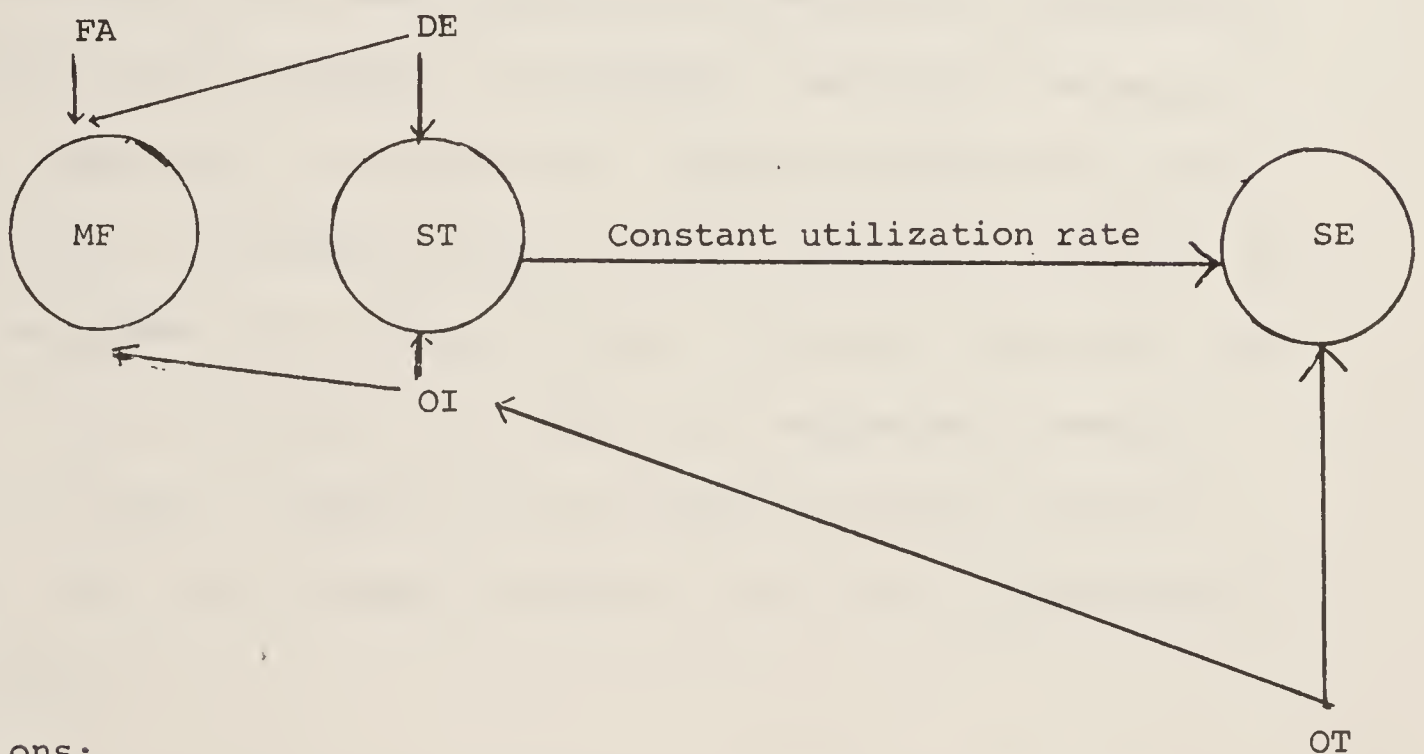
BASIC ASSUMPTIONS OF THE HOUSING MODEL

Participants:

- (OI) - Purchasers of housing units
- (OT) - Consumers of housing services
- (DE) - Builders of housing units
- (FA) - Financial intermediaries, e.g., chartered banks, trust companies, life insurance companies, mortgage loan companies

Markets:

- (ST) - Market for housing stock
- (SE) - Market for housing services
- (MF) - Market for mortgage funds



Assumptions:

- (A1) Integration of markets for housing stock and housing services
- (A2) Exclusion of the explicit discussion on mortgage market
- (A3) Use of single and multiple housing units as proxies for owner-occupied and rental housing units

III. SUPPLY AND DEMAND RELATIONSHIPS

A. The Demand for Housing Services

The present housing study is based on the interaction of supply and demand forces on the housing market. It follows from the basic consumer theory that the demand for housing services, a consumer good, can be considered in the framework of the theory of consumer choice. By maximizing utility subject to budget constraints, the demand for housing services may be determined by real income and the price of housing services relative to the price of other goods and services.

As housing services are yielded by the housing stock, a durable investment good, some factors which indicate the availability of credit may also be relevant. In addition, demographic forces may be crucial especially in the long-run. Before we discuss the factors which may affect the demand for housing, it is desirable to define the units of measurement for housing services. Since the utilization rate of housing stock is assumed to be unity, the unobservable housing services are taken as identical to the observable housing stock in magnitude. Thus, what we need to define is the unit of measurement of housing stock.

Housing stock is obviously non-homogeneous in the sense that indefinite variations in type of construction, floor space and location exist. Although it is preferable to take into account the quality of housing stock, the data available do not permit us to proceed along this

direction. For example, data on the size of housing units are available only for the floor area of new houses financed under the National Housing Act and even this index of size is regarded as misleading. Housing stock in this study is expressed in dwelling units and one unit of housing service is correspondingly defined as the quantity of service generated by one unit of housing stock per unit of time. Such unit of measurement for housing services, as will be seen, has certain implications on the effect of some independent factors on the housing demand. Now let us turn to the determinants of the demand for housing.

Price of Housing Services

As we consider the demand for housing services rather than the demand for housing stock, the price of housing services should be used in the demand relationship instead of the price of housing stock. The ^{former} ~~latter~~, however, is unobservable for single or owner-occupied housing units and its value must be imputed.

In this study, we use a linear approximation such that, the price of housing services is linearly related to the price of housing stock, a weighted average of the mortgage rate, representing the direct cost of mortgage financing, and the corporate bond rate, representing the opportunity cost of our financing, and finally the tax rate. Since these rates are taken as exogenous in this study, the price of housing stock is the only factor considered in the expression of the price for housing services, which clears the market for owner-occupied housing units.

For rental housing, average rent is used as proxy for the price of housing services. This treatment is based on the assumption that the imputed price of services for rental housing is fully reflected

by the rent: landlords will stop investing in rental housing and invest elsewhere if rents fail to recover the costs of property taxes, interest on borrowed money, obsolescence and other cost items.

Income

Higher income has a positive effect on the demand for housing, both owner-occupied or rental units. The demand for owner-occupied housing is greater with higher income because more families can afford the downpayment and the monthly carrying cost of home ownership. Higher income also results in undoubling in the sense that more people are able to afford rent payments and maintain separate living accommodation, which in turn, increases the demand for rental units. Income sometimes also serves as a proxy for demographic factors because net family formation, family undoubling, and nonfamily household formation are all influenced favourably by higher income.

Price of Other Consumer Goods and Services

This factor is introduced to represent the substitution effect between housing services and other consumer goods and services.

Availability of Mortgage Credit

The cost of mortgage credit represented by the mortgage rate has a direct influence on the demand for housing. If the mortgage rate responds sufficiently to clear the mortgage market, the mortgage rate alone should be sufficient to capture the financial effect on the housing market. However, if the mortgage rate fails to clear the mortgage market, especially in the short run, credit rationing occurs.

The difference between the mortgage rate and the bond rate is frequently used to capture the effect of credit rationing. The

supply of mortgage credit from private financial institutions appears to be quite sensitive to this difference. The availability of public funds is usually represented by the direct lending activity of Central Mortgage and Housing Corporation (CMHC).

For rental housing units, since tenants pay only rent, the cost and availability of credit do not affect the demand for housing services directly. Credit terms, however, may play the role of allocating the housing demand between rental and owner-occupied units. As credit terms become more stringent, the demand for owner-occupied housing units may decline while the demand for rental housing may rise, because stringent credit terms discourage families to shift from rental to owner-occupied housing and also induce them to undouble into rental rather than owner-occupied housing units.

Demographic Forces

Demographic forces are rather important in explaining the demand for housing especially in the long-run. There are two ways of including a demographic variable in the demand function for housing: it may be included as an explanatory variable or it may serve as a deflator for the demand for housing. Since owner-occupied and rental housing units are occupied mainly by family and non-family households respectively, the number of family households is the appropriate demographic variable for the demand function for the former and the number of non-family households for the latter. Data limitations, however, lead us to use estimates for family and non-family households. These estimates were derived by interpolating Census data on family and non-family households available for the years 1961, 1966 and 1971.

Thus, on the basis of the above discussion, the demand for single housing units may be related to real disposable income, the price of single housing, the difference between the mortgage rate and the bond rate and the amount of NHA loans approved by CMHC for single housing units.

Similarly the demand for multiple housing units is dependent upon real disposable income, the mortgage rate, rent, and the amount of NHA loans approved by CMHC for multiple housing.

B. The Supply of Housing Services

Since the utilization rate of housing stock is assumed to be unity, the housing stock is the only input in the production of housing services. At any point of time, the quantity of housing stock is fixed, so are housing services. The treatment of housing supply as fixed during the short-run is based on the assumption that new construction, removals and depreciation which change the housing stock at each period of time represent only a very small proportion of the housing stock. As a result, their effect on the housing stock can be neglected in determining the equilibrium housing price and rent.

C. Equilibrium Conditions

The market for housing services is in equilibrium when housing demand is equal to housing supply. Using the equilibrium conditions and the demand relations mentioned earlier it is possible to determine the price of single and the rent of multiple housing units.

D. Supply of New Housing

It is assumed in this study that housing supply is fixed in the short-run. This assumption is justified in view of the fact that

annual net additions to the housing stock usually represent a very small proportion of the existing stock (less than four percent in Ontario). The housing stock is actually increased by new construction and conversions, and decreased by depreciation and removals. Since conversions and removals are usually taken as a constant proportion of housing stock at the beginning of each period, the supply of new housing, or new construction, deserves special attention because it appears that government policies can affect the housing supply only through their effects on the supply of new housing.

Generally speaking, the price of owner-occupied housing, or rent for rental housing together with other factors representing the cost of housing production and financing will affect the supply of new housing. No matter whether the developers plan to sell, rent or retain as long-term investment, the decision to undertake a construction project ultimately depends on its profitability determined by the expected yield and cost. It is therefore reasonable to assume that the price of housing or rent, interest cost, taxes, land and construction cost will affect the supply of new housing represented by housing starts.

The land cost is important in determining the form of construction to be undertaken since a rising land cost will encourage higher density (land utilization). Therefore, as the land cost rises the supply of rental or multiple housing units is expected to decline only moderately relative to owner-occupied or single units.

Housing starts are also affected by the availability of credit and the vacancy rate. Developers are influenced by the availability of

credit in two ways. Directly, they need funds to carry out the construction projects. Indirectly, the final product will be difficult to sell in the market if the cost of credit and the downpayment requirements are too stringent for the prospective purchasers. The vacancy rate is an indicator of excess supply. When vacancies are high relative to the available housing units, they have a depressive effect on the market which tends to reduce housing starts.

Thus, we may postulate the hypothesis that housing starts for single and multiple housing depend on the price of housing and rent, respectively, the corresponding vacancy rate, the mortgage rate and the cost of construction reflecting the cost for land, labour and building materials.

E. Housing Completions

Both single and multiple completions in the current year are related to single and multiple housing starts, respectively, in the same and in previous years.

F. Housing Stock

By definition, the housing stock existing at any time period can be expressed as follows:

Housing stock in the current year is equal
to the housing stock in the previous year
plus completions plus conversions minus
depreciation and removals.

IV. STATISTICAL RESULTS

A. The Demand for Housing

In the previous chapter we discussed the theoretical framework on which we have based various hypotheses regarding the determinants of the demand for and supply of housing in Ontario. These hypotheses have been statistically tested using regression analysis and the results are reported in this chapter. The data series used in this study are given in Appendix A and the method of compiling each series is described individually in Appendix B.

The determinants of aggregate demand for single housing units in Ontario are shown in Table I. There are, essentially, four factors influencing demand; personal disposable income, availability of credit, the price of housing and the number of family households. The estimated weight (coefficient) of each factor and its direction of influence (positive or negative) is evident from this Table.

Table I
Determinants of the Demand
for Single Housing Units in Ontario
(Estimated Weights)

1. Constant *	+ 630908
2. Personal Disposable Income (millions of 1961 dollars)	+ 47.6
3. Availability of Private Credit -- Mortgage Rate minus Bond Rate (per cent)	+ 60286.6
4. Average Price of Housing (dollars)	- 13.96
5. Number of Family Households (thousands)	+ 83.39

* The constant term indicates the demand for single housing units when personal income and all other determinants are eliminated. A similar interpretation applies to the constant term in subsequent tables.

In measuring the partial effect of a determinant, listed in the above Table, on the demand for housing we must bear in mind the units of measurement in each case. Thus if we wish to interpret the weight of personal disposable income, measured in millions of dollars, we can state that if real disposable income is increased by one million dollars, the demand for single housing will increase by approximately 48 units, other things being equal. Similarly, an increase in the number of family households by a thousand, *ceteris paribus*, will generate an additional demand of 83 housing units. On the other hand, if the average price of housing goes up by one dollar or any multiple, say \$1000, the demand for single housing will decline by fourteen units or 14,000 units respectively.

The factors which determine the demand for multiple housing are listed in Table II.

Table II
Determinants of the Demand
for Multiple Housing Units in Ontario
(Estimated Weights)

1. Constant	+ 162729
2. Personal Disposable Income of Previous Year (millions of 1961 dollars)	+ 38.03
3. Average Rent (index 1961=100)	- 5393.74
4. Average Rent of Previous Year (index 1961=100)	+ 2182.84
5. Mortgage Rate of Previous Year (percent)	+ 11941.21
6. Non-family Households (thousands)	+ 789.64

As in the case of Table I, the weights shown in Table II indicate the marginal effect of each determinant on the demand for multiple housing units. Thus, if income is increased by a million dollars, other things

being equal, the demand for multiple housing will increase by approximately 38 units. The number of non-family households exerts a strong influence on the demand for multiple housing since an increase of a thousand households will stimulate additional demand of about 790 multiple units.

The results in Tables I and II indicate that income has a lesser impact whereas the demographic factor has a greater impact on the demand for multiple housing in comparison to single housing.

The large weight of the mortgage rate in Table II indicates that the demand for multiple housing is very sensitive to this factor. The positive sign of the mortgage weight may be interpreted as a measure of the substitution effect between single and multiple housing, so that a higher mortgage rate presumably discourages the demand for single housing and shifts the demand to multiple housing, with a lag of one year. Thus, if the mortgage rate goes up by one point this year it is expected to create a demand of approximately 12,000 multiple units next year.

The demand for multiple housing is also strongly affected by rent. As the rent index prevailing in the current year is increased by one point, the demand for multiple housing is anticipated to decline by about 5,400 units, other things remaining the same. However, the rent index prevailing in the previous year has a positive effect on the demand for multiple housing units, thus reducing the overall effect of the rent factor on the demand.

The above discussion was carried out within the framework of marginal analysis by postulating a unit change in one factor, other

things being equal, and evaluating its effect on the demand for single or multiple housing units. The information contained in Tables I and II can also be translated into elasticities which indicate the impact of the demand factors on a percentage basis. These elasticities, shown in Table III were computed at the point of the arithmetic mean of the variables listed in this Table. They

Table III
Elasticities of the Demand
for Single and Multiple Housing Units

Determinant	Single Housing	Multiple Housing
1. Personal Disposable Income	+ 0.567	+ 0.795
2. Difference of Mortgage and Bond Rate	+ 0.070	
3. Average Price of Housing	- 0.243	
4. Average Rent		- 0.900
5. Average Mortgage Rate		+ 0.139
6. Family Households	+ 0.108	
7. Non-family Households		+ 0.359

measure the percentage change in demand resulting from a change of one percent in personal disposable income or any other variable listed in Table III. For example, a one percent increase in income will result in about four-fifths of one percent increase in multiple housing demand and about three-fifths of one percent increase in single housing demand.

B. Housing Starts

We have discussed the demand side of the housing market as noted above. Next, we consider the supply side of the market which consists of housing starts and housing completions.

The estimated weights of the factors influencing single housing starts are shown in Table IV. These factors are: the price of housing, the cost of housing (construction and land cost) and the mortgage rate. The latter apparently has a significant negative

Table IV
Determinants
of Single Housing Starts
(Estimated Weights)

1. Constant	+ 34411
2. Average Price of Housing (dollars)	+ 2.99
3. Average of Housing Cost at Current and Previous Year (dollars)	- 1.95
4. Average Mortgage Rate (percent)	- 3648.45

effect on single housing starts in the sense that a one point increase in the rate will depress starts by more than 3,600 units, other things kept constant.

In the case of multiple housing starts, rent and the mortgage rate are the predominant factors as can be seen from Table V.

Table V
Determinants
of Multiple Housing Starts
(Estimated Weights)

1. Constant	- 195598
2. Average Rent (percent)	+ 3972.91
3. Average of Housing Cost at Current and Previous Year (dollars)	- 7.64
4. NHA Loans approved by CMHC (millions of 1961 dollars)	+ 73.92
5. Average of Mortgage Rate at Current and Previous Year (percent)	- 11375.76
6. Year to Year change in Number of Non-family Households (thousands)	+ 2407.42

The supply elasticities for single and multiple housing starts are given in Table VI.

Table VI
Elasticities
of Single and Multiple Housing Starts

Determinant	Single Starts	Multiple Starts
1. Price of Housing	+ 2.30	
2. Cost of Housing	- 1.48	- 3.98
3. Rent		+ 10.53
4. Mortgage Rate	- 1.02	- 2.16
5. NHA Loans Approved by CMHC		+ 0.23
6. Change in Non-family Households		+ 1.07

As expected, single housing starts are significantly affected by housing price and multiple housing starts by rent and both are influenced by housing costs and the mortgage rate. Judging from the information in Tables IV, V and VI, it appears that developers of multiple dwelling units are more responsive to housing costs and the mortgage rate than those of single dwelling units.

C. Housing Completions

Housing completions are, essentially, affected by housing starts in the current and previous years. The estimated weights of starts affecting single and multiple housing completions are shown in Tables VII and VIII respectively.

Table VII
Determinants
of Single Housing Completions
(Estimated Weights)

1. Single Housing Starts of Current Year (units)	+ 0.62
2. Single Housing Starts of Previous Year (units)	+ 0.38

Table VIII
Determinants
of Multiple Housing Completions
(Estimated Weights)

1. Multiple Housing Starts of Current Year (units)	+ 0.18
2. Multiple Housing Starts of Previous Year (units)	+ 0.76

The results of Table VII imply that about 62 percent of single housing completions in the current year result from housing starts in the same year and the remaining 38 percent have started in the previous year.

For multiple housing completions in Table VIII the weights sum to 0.94. By normalizing, these weights add to unity and the adjusted values were 0.19 for single and 0.81 for multiple starts. These values indicate that about 19 percent of current multiple housing completions result from corresponding starts in the same year and about 81 percent are starts of the previous year. Evidently, multiple housing starts require a longer period to be completed relative to single housing starts.

V. APPLICATIONS

A. Housing Objectives

The major objective of governmental housing policy can be generally defined as the provision of adequate housing for the population at reasonable cost. In other words, it is an accepted responsibility of the government to close the widening gap between the rising price and rent of housing and the ability of many people to pay for it. Based on this objective, housing policies should aim at (a) reducing the price and rent of housing by increasing the supply through programs which lower the cost of housing and (b) increasing the financial ability of the people to meet their housing requirements and thus encourage the consumption of housing services through housing assistance programs.

The implication of this objective and the corresponding housing policies to achieve it can be seen more clearly in Figure 1. Only the owner-occupied or single housing is considered in this figure for simplicity but it is obvious that the discussion can also be applied to rental or multiple housing. Housing supply (SS) as shown in this figure is rather inelastic with respect to housing price (P) because housing starts, even though possibly price-elastic, account for a very small proportion of housing stock. DS represents demand for single housing.

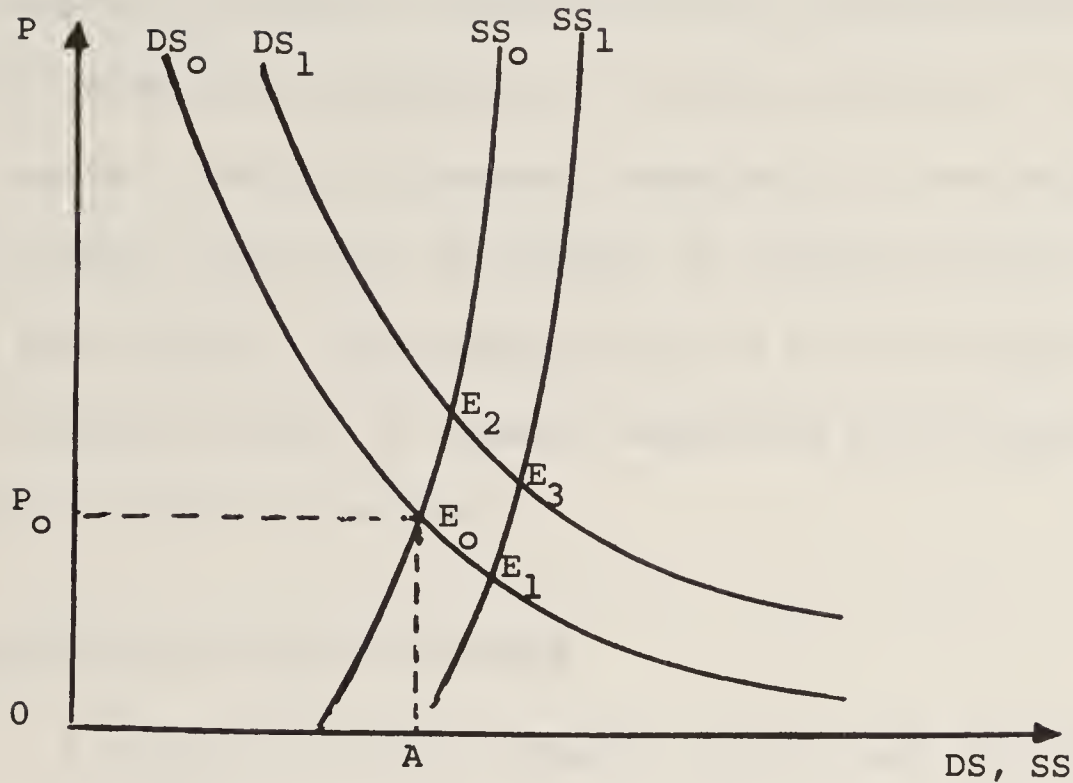


Figure 1

If the price P_0 is considered too high and the level of housing (OA) inadequate as determined by SS_0 and DS_0 at E_0 , the government can influence the housing market in several ways. One example would be to introduce policies which result in a shifting of the supply curve from SS_0 to SS_1 . This will reduce the housing price and increase the level of housing as shown by equilibrium E_1 . Alternatively, by shifting the demand curve from DS_0 to DS_1 to attain a new equilibrium at E_2 , a higher level of housing consumption is encouraged as a result of government policies designed to increase the ability of people to meet their housing requirements. Point E_3 in Figure 1 depicts the equilibrium level determined by shifting both SS and DS to SS_1 and DS_1 respectively. Given the positively sloping SS and the negatively sloping DS , E_3 must lie at the south-east of E_2 , indicating that the price is lower and the level of housing consumption higher at E_3 than at E_2 .

The previous illustration clearly reveals that an increase in the supply of housing is effective both in lowering the housing price and encouraging consumption of housing services. It should be noted, however, that of the several components of housing supply, only current housing starts can be affected by housing policies initiated at each time period. This perhaps explains why the supply of new housing (housing starts) is usually emphasized as an important relationship in studies on housing.

B. Evaluation of Housing Programs

A variety of housing programs can be used to achieve the housing objectives discussed earlier. While some of these programs may be directed primarily to lowering the price of housing or rent by means of increasing housing supply, or rent and price controls, other measures may encourage the consumption of housing services through housing assistance programs. In this section, certain program alternatives relating to these two categories are briefly mentioned. Their effect on the housing market will be estimated in a subsequent stage of this study which involves projections of housing demand in Ontario to 1980.

Programs to Increase Housing Supply

Apart from the provision of public housing, the basic approach of government policies designed to increase housing starts and thus housing supply is to reduce housing costs. Among these programs, public land assembly, leasing public land, and servicing of land, aim at reducing the cost of land; public assistance to builders and developers, in the form of mortgage lending, aim at reducing the cost and increasing the

availability of financing; finally, reduction of the tax rate on building materials, and labour regulations are directed at lowering the cost of materials and labour.

The effects of these programs on the housing supply can be evaluated directly using the housing starts and housing stock relationships which incorporate the above policy instruments.

Rent and Price Controls

The economic effect of rent and price controls is obvious from this study: controlled rent and price, other things being equal, discourage the construction industry from producing more housing units. Therefore, rent and price controls, unless supplemented by other programs which tend to increase the supply of housing, appear to increase the housing shortage. The quantitative analysis of such effects is also possible by means of the results obtained in this report.

Housing Assistance Programs

The effect of housing assistance programs such as mortgage assistance, home ownership assistance, subsidized assistance (rent supplements and other forms of income maintenance), reduction in property taxation, etc., is that more people can afford to enter the housing market.

Housing assistance programs which have the tendency to increase the demand for housing may lead to a sudden increase in the price of housing and rent. However, a higher price and rent may produce a favorable effect on the supply of new housing. For example,

income subsidies, which drive up the price of housing and rent, are likely to increase significantly the supply of housing because housing starts are very elastic with respect to rent or price, as is evident from the corresponding elasticities, for single and multiple housing starts, reported in Table VI of the previous chapter.

In conclusion, the results obtained in this study can greatly assist in testing, analysing and evaluating alternative policy options, and thus arriving at optimum solutions to the housing problems of Ontario.

APPENDIX A
STATISTICAL DATA

Year	(1) Average Bond Rate (percent)	(2) Multiple Housing Completions (units)	(3) Single Housing Completions (units)	(4) Residential Construction Expenditure (\$million)	(5) Multiple Housing Stock end-year (units)	(6) Single Housing Stock end-year (units)
1948		1,722	24,699		333,974	820,397
1949		2,294	29,146		343,966	844,519
1950		3,376	27,942		349,314	867,289
1951	3.67	5,495	26,237	378.2	356,812	888,215
1952	3.97	4,513	22,948	337.4	363,371	905,723
1953	4.00	6,932	28,241	431.8	372,386	928,418
1954	3.58	9,688	31,397	528.2	384,209	954,129
1955	3.57	12,266	39,346	647.3	398,678	987,632
1956	4.16	10,480	40,721	633.2	411,444	1,022,305
1957	4.53	12,114	32,973	572.1	425,917	1,049,017
1958	4.52	19,449	40,102	737.2	447,808	1,082,695
1959	5.47	17,441	36,840	681.0	467,817	1,112,905
1960	5.49	18,410	28,572	555.4	488,909	1,134,662
1961	5.29	16,644	27,110	543.3	508,356	1,154,824
1962	5.31	22,531	24,756	563.9	533,777	1,172,552
1963	5.26	19,156	24,244	587.2	555,994	1,189,616
1964	5.36	30,510	27,229	729.7	589,691	1,209,560
1965	5.41	28,975	27,593	718.5	622,047	1,229,746
1966	6.02	41,724	26,683	732.0	667,338	1,248,898
1967	6.39	31,786	26,492	728.3	699,009	1,275,222
1968	7.23	39,841	28,162	926.4	738,695	1,303,264
1969	8.06	48,834	31,402	1,064.5	787,364	1,334,543
1970	8.60	45,780	23,551	1,172.4	832,969	1,357,968
1971	7.63	48,417	25,732	1,161.8	881,201	1,383,572
1972	7.75	62,091	34,347	1,297.3	943,096	1,417,788
1973	8.01	56,791	41,471	1,500.7	999,677	1,459,125

	(7)	(8)	(9)	(10)	(11)	(12)
	Multiple Housing Stock mid-year	Single Housing Stock mid-year	NHA Loans Approved by CMHC for mid-year	Average Mortgage Rate	Non-family Households	Family Households
Year	(units)	(units)	(\$million)	(percent)	(thousands)	(thousands)
1948						
1949						
1950						
1951				5.41		
1952	360,092	896,969		5.75		
1953	367,879	917,070		5.88		
1954	378,297	941,273	7.37	5.86		
1955	391,443	970,880	5.02	5.59		
1956	405,061	1,004,968	6.74	5.85		
1957	418,680	1,035,661	128.20	6.34	199	1,276
1958	436,862	1,065,856	184.96	6.40	200	1,317
1959	457,812	1,097,800	148.76	6.57	204	1,358
1960	478,363	1,123,783	58.66	7.01	210	1,393
1961	498,632	1,144,743	85.93	6.95	218	1,423
1962	521,066	1,163,688	40.22	6.79	227	1,447
1963	544,885	1,181,084	90.42	6.66	239	1,471
1964	572,842	1,199,588	110.92	6.60	252	1,505
1965	605,869	1,219,653	128.28	6.63	268	1,544
1966	644,692	1,239,322	159.91	7.24	286	1,590
1967	683,173	1,262,060	234.53	7.74	305	1,637
1968	718,852	1,289,243	157.35	8.95	327	1,679
1969	763,029	1,318,903	149.73	9.61	350	1,721
1970	810,166	1,346,255	243.50	10.28	375	1,773
1971	857,085	1,370,770	152.45	9.33	403	1,825
1972	912,148	1,400,680	104.89	9.11	432	1,876
1973	971,386	1,438,456	88.60	9.43	464	1,941

	(13)	(14)	(15)	(16)	(17)	(18)
Year	Average Housing Price	Rent Index	Multiple Housing Starts	Single Housing Starts	Construction and Land Cost	Personal Disposable Income
	(dollars)	(1961=100)	(units)	(units)	(dollars)	(\$million)
1948						
1949						
1950						
1951		78.1				6,738
1952		83.0				7,201
1953		86.8				7,656
1954		91.1				7,834
1955		94.9	10,199	43,257		8,446
1956		96.5	11,170	37,542		8,992
1957		98.1	13,958	33,781		9,553
1958		99.9	21,740	42,013	15,153	10,015
1959		100.4	19,464	34,694	15,635	10,332
1960	15,748	100.2	18,303	23,979	16,392	10,592
1961	15,578	100.0	21,917	26,227	17,090	10,720
1962	15,796	99.6	20,920	23,386	16,644	11,374
1963	15,996	99.5	28,957	27,000	16,702	11,972
1964	16,652	99.7	37,737	27,880	17,194	12,578
1965	17,739	100.5	40,195	26,572	18,573	13,453
1966	20,096	102.9	26,126	26,229	22,409	14,448
1967	22,912	107.8	41,526	26,595	22,784	15,183
1968	24,024	113.2	50,793	29,582	22,677	15,952
1969	25,487	118.7	50,890	30,556	25,890	16,853
1970	26,941	123.1	55,098	21,577	27,433	17,490
1971	27,994	125.7	58,892	31,088	27,842	18,602
1972	29,366	127.5	65,001	37,932	28,813	19,874
1973	34,197	129.8	67,785	42,751	31,613	21,694

APPENDIX B

COMPILATION OF DATA

(1) Average bond rate, percent

$B_r = \frac{1}{2}(B_g + B_{40})$ where B_g and B_{40} are simple averages of rates from January to December and

B_g = Average yield on federal long-term bonds from CHS

B_{40} = Average yield on forty bonds (municipal, provincial, public utility, industrial, ten of each), computed from monthly yields published by McLeod, Young, Weir & Co.

(2) Multiple housing completions, dwelling units

This variable is the sum of housing completions of semi-detached and duplex, row, and apartment, obtained from Statistics Canada: publication number 64-002 Housing Starts and Completions (formerly New Residential Construction) -- abbreviated as SC 64-002.

(3) Single housing completions, dwelling units

The housing completions for single-detached dwelling are obtained from SC 64-002.

(4) Residential construction expenditure, millions of 1961 dollars

$$I_c^* = I_c / P_c$$

where

I_c = Residential construction expenditure, millions of dollars, from SC 61-205 Private and Public Investment in Canada, Outlook and Regional Estimates.

P_c = Implicit price index of residential construction in Canada, 1961=100, from SC 13-201 System of National Accounts -- National Income and Expenditure Accounts

(5) Multiple end-year housing stock, dwelling units

This variable is the sum of last year's stock plus completions and conversions in the current year minus depreciation and removals. The benchmark estimates of housing stock which are derived from Census figures are obtained from the Housing and Building Permits Section of Statistics Canada.

(6) Single end-year housing stock, dwelling units

This variable is computed in the same way as the multiple housing stock and the data sources are the same.

(7) Multiple mid-year housing stock, dwelling units, obtained from the equation

$$K_m^* = \frac{1}{2}[K_m + (K_m)_{-1}] \quad \text{where } K_m^* \text{ is mid-year multiple housing stock} \\ \text{and } K_m \text{ is end-year multiple housing stock}$$

(8) Single mid-year housing stock, dwelling units, obtained from the equation

$$K_s^* = \frac{1}{2}[K_s + (K_s)_{-1}] \quad \text{where } K_s^* \text{ is mid-year single housing stock} \\ \text{and } K_s \text{ is end-year single housing stock}$$

(9) NHA loans approved for new houses by CMHC, millions of 1961 dollars

$$L = \ell / P_c$$

where

ℓ = NHA loans approved for new houses by CMHC, millions of dollars from Ontario Regional Office of CMHC

P_c = Implicit price index of residential construction in Canada, 1961=100.

(14) Rent index, 1961=100, obtained as follows:

$$R = W_T R^T + W_O R^O$$

where

R^T and R^O are rent indexes of Toronto and Ottawa respectively.
 W_T and W_O are weights and $W_T + W_O = 1$.

The rent index, relevant for Ontario, is available from Statistics Canada only for two cities: Ottawa and Toronto. It appears that if the rent index for Ontario has to be constructed, the composite index for Toronto and Ottawa may be the only alternative. Monthly rent indices for Toronto and Ottawa are obtained directly from the Prices Division of Statistics Canada. These indices are a by-product of the Labour Force Survey and cover all types of rental units. R^T and R^O are simple averages of rent indices for each year. Information from the 1961 Census on the relative rent expenditure in Toronto and Ottawa is used as weights to compute the composite index i.e.,

$$\begin{aligned} R_t \quad (1961=100) &= \frac{r_t^T \cdot q_{1961}^T + r_t^O \cdot q_{1961}^O}{r_{1961}^T \cdot q_{1961}^T + r_{1961}^O \cdot q_{1961}^O} \\ &= \sum_{i=T,O} \left[\left(\frac{r_{1961}^i \cdot q_{1961}^i}{\sum_{i=T,O} r_{1961}^i \cdot q_{1961}^i} \right) \frac{r_t^i}{r_{1961}^i} \right] \\ &= \sum_{i=T,O} W_i R_t^i \end{aligned}$$

where

$$\begin{aligned} r^i &= \text{Rent level in City } i \text{ (} i = \text{Toronto or Ottawa)} \\ q^i &= \text{Number of rental units in City } i \end{aligned}$$

Multiple housing stock in each city is used to represent rental housing units and their values together with the rent levels in 1961 are obtained from the 1961 Census. W_T and W_O are calculated as 0.82 and 0.18 respectively.

(10) Average mortgage rate, percent

$M_r = \frac{1}{2}(M_c + M_n)$ where M_c and M_n are simple averages of rates from January to December as published in CHS and

M_c = Conventional mortgage rate

M_n = NHA mortgage rate: before 1968, the interest rate (maximum) on NHA insured loans and after 1968, the average of NHA interest rates on approved lenders home-ownership and rental loans.

(11) Non-family Households, thousands

This variable is derived by means of interpolation using the numbers of non-family households from Census years 1961, 1966 and 1971.

(12) Family Households, thousands

This variable is derived by the same method as for non-family households. The numbers of family households from Census years 1961, 1966 and 1971 are used instead.

(13) Average housing price, dollars, obtained as follows:

$$P = \frac{1}{2}(P_m + P_n)$$

where

P_m = Average price of properties sold through Multiple Listing Service for Ontario, obtained from the Canadian Real Estate Association.

P_n = Weighted average price of new single-detached dwellings financed under National Housing Act (NHA) in Ontario seven metropolitan areas: Hamilton, Kitchener, London, Ottawa, Sudbury, Toronto and Windsor. Since similar data for total Ontario are not available, this weighted average price is used as a proxy for provincial price. The number of units sold in these areas are used as weights. All the data in calculating the weighted average price are obtained from the Ontario Regional Office of Central Mortgage and Housing Corporation (CMHC).

(15) Multiple housing starts, dwelling units

This variable is the sum of housing starts of semi-detached and duplex, row, and apartment from SC 64-002.

(16) Single housing starts, dwelling units

The data are obtained from SC 64-002.

(17) Total cost (construction and land costs) of single-detached dwellings financed under NHA, dollars

Since the data on cost for Ontario are not available, cost used in this study is the weighted average of the total cost of NHA financed single-detached dwellings in seven metropolitan areas in Ontario as in calculating P_n . Although the data of total cost in these seven metropolitan areas for bungalow, one component of single-detached dwelling, are available before 1969 in Canadian Housing Statistics (CHS), that for single-detached dwelling has been published only since 1969. The former is then multiplied by the national ratio of total cost of single-detached dwelling to that of bungalow, both financed by NHA, to get the estimates for the latter for the years prior to 1969. These converted cost figures from seven metropolitan areas are finally weighted by respective share of total number of single-detached dwellings financed by NHA to the cost variable for Ontario.

(18) Ontario personal disposable income, millions of 1961 dollars

$$Y_d^* = Y/P_e$$

where

Y = Ontario personal disposable income, millions of dollars, from SC 13-201 System of National Accounts - National Income and Expenditure Accounts

P_e = Implicit price index of personal expenditure on consumer goods and services, 1961=100, also from SC 13-201.

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